

Claims

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A vehicle cooling package comprising:
 - a heat exchanger assembly;
 - a fan shroud mounted to the heat exchanger assembly, the fan shroud having a diverting surface;
 - a diverter plate mounted adjacent to the fan shroud and spaced therefrom;
 - a fan interposed between the fan shroud and the diverter plate; and,
 - a vehicle hood enclosing the heat exchanger assembly, the fan shroud, the diverter plate, and the fan, the hood having at least one surface having air discharge apertures corresponding with the space between the diverting surface and the diverter plate when the hood is closed;

wherein the diverting surface of the fan shroud and the diverter plate are each angled from the axis of the fan when the fan shroud and diverter plate are assembled to the vehicle, so as to closely match a natural discharge angle of the fan, and the diverting surface and the diverter plate both extend toward the hood assembly when the hood is closed so that air is discharged from the fan at a high velocity from under the hood through the air discharge apertures.
2. A vehicle cooling package according to claim 1 wherein the heat exchanger assembly is in fluid communication with an engine of a vehicle.
3. A vehicle cooling package according to claim 1 wherein the fan shroud has a fan aperture defined by a circumferential wall extending outwardly from the main body portion and the diverting surface extends from the circumferential wall opposite the main body portion.

4. A vehicle cooling package according to claim 1 wherein the diverter plate has a central aperture.
5. A vehicle cooling package according to claim 1 wherein one or more diffuser screens are interposed between a lower portion of the main body and the diverting surface of the fan shroud when the fan shroud and diverter plate are assembled to the vehicle.
6. A vehicle cooling package according to claim 1 wherein the heat exchanger assembly comprises one or more heat exchangers mounted to a frame.
7. A vehicle cooling package according to claim 6 wherein the fan shroud is mounted to the frame and provides a generally enclosed air passage between the heat exchanger(s) and the fan, which is partially disposed within the fan shroud.
8. A vehicle cooling package according to claim 1 wherein the fan shroud is a unitary member molded from a thermoset or thermoplastic material.
9. A vehicle cooling package according to claim 6 wherein the fan shroud includes one or more mounting flanges adapted to mateably engage the heat exchanger frame.
10. A vehicle cooling package according to claim 1 wherein the diverting surface and main body portion include stiffening ribs.
11. A vehicle cooling package according to claim 1 wherein the fan shroud has plumbing recesses.
12. A vehicle cooling package according to claim 1 wherein the diverter plate has a main section and a removable section.

13. A vehicle cooling package according to claim 1 wherein the main section and removable section are each provided with mating flanges to facilitate attachment of the sections to one another by way of appropriate fasteners.
14. A vehicle cooling package according to claim 1 wherein the diverter plate includes a pair of side flanges extending perpendicularly outward from the main body.
15. A vehicle cooling package according to claim 14 wherein the side flanges serve as a mounting surface for appropriate screens adapted to fit over the gap between the fan shroud and the diverter plate.
16. A vehicle cooling package according to claim 1 wherein the diverter plate includes plumbing recesses or apertures to facilitate routing of plumbing under the hood.
17. A vehicle cooling package according to claim 1 wherein the diverter plate includes stiffening ribs.
18. A vehicle cooling package according to claim 1 wherein the diverter plate is mounted to the vehicle structure by way of a first mounting boss located directly above the central aperture and one or more additional mounting bosses providing additional attachment points for affixing the diverter plate to a front support of the vehicle.
19. A vehicle cooling package according to claim 18 wherein the first mounting boss is adapted to matingly fasten to a thermostat housing bolted to an engine block of the vehicle.
20. A vehicle cooling package according to claim 1 wherein the air discharge apertures of the hood assembly are fitted with screens or grids.

21. A vehicle cooling package according to claim 1 wherein a vehicle front support has one or more air discharge vents which are generally aligned with the space between the diverting surface of the fan shroud and the diverter plate.
22. A vehicle cooling package according to claim 1 wherein a wheel well louver has one or more air discharge vents which are generally aligned with the space between the diverting surface of the fan shroud and the diverter plate.
23. A vehicle cooling package according to claim 1 wherein the fan has a naturally radial discharge component of 60 to 80 degrees.
24. A vehicle cooling package according to claim 1 wherein the diverting surface of the shroud and the diverter plate extend fully to the hood when the hood is closed.
25. A vehicle cooling package according to claim 1 wherein a gap is provided between the hood and the diverter plate so that air is drawn from an engine compartment of the vehicle by a venturi effect of air exiting the hood enclosure at the air discharge apertures.
26. A vehicle cooling package according to claim 1 wherein a port is provided in the diverter plate for communicating fan discharge air directly to one or more pre-selected component(s).
27. A fan shroud for a vehicle cooling fan comprising:
 - a main body portion with a fan aperture therein, the fan aperture being defined by a circumferential wall extending outwardly from the main body portion of the fan shroud;
 - a diverting surface extending from the circumferential wall opposite the main body portion at an angle to the axis of a fan when the fan is disposed in the fan aperture, the angle of the diverting surface corresponding to a natural discharge

angle of the fan.

28. A fan shroud for a vehicle according to claim 27 wherein the fan shroud is a unitary member molded from a thermoset or thermoplastic material.

29. A fan shroud for a vehicle according to claim 27 wherein the fan shroud includes one or more mounting flanges.

30. A fan shroud for a vehicle according to claim 27 wherein the diverting surface and main body portion include stiffening ribs.

31. A fan shroud for a vehicle according to claim 27 wherein the fan shroud has plumbing recesses or apertures.

32. A diverter plate for a vehicle cooling fan comprising:
a main body portion angled from the axis of a fan disposed adjacent thereto at an angle corresponding to a natural discharge angle of the fan.

33. A diverter plate for a vehicle cooling fan according to claim 32 wherein the main body portion includes a central aperture.

34. A diverter plate for a vehicle cooling fan according to claim 32 wherein the main body portion has a main section and a removable section.

35. A diverter plate for a vehicle cooling fan according to claim 34 wherein the main section and removable section are each provided with mating flanges to facilitate attachment of the sections to one another by way of appropriate fasteners.

36. A diverter plate for a vehicle cooling fan according to claim 32 wherein the diverter plate includes a pair of side flanges extending perpendicularly outward from the main body.

37. A diverter plate for a vehicle cooling fan according to claim 36 wherein the side flanges serve as a mounting surface for appropriate screens adapted to fit over the gap between the fan shroud and the diverter plate to prevent foreign objects from being introduced into the fan area even when the hood is opened.
38. A diverter plate for a vehicle cooling fan according to claim 32 wherein the diverter plate includes plumbing recesses or apertures.
39. A diverter plate for a vehicle cooling fan according to claim 32 wherein the main body portion has one or more diffuser screens extending therefrom.
40. A diverter plate for a vehicle cooling fan according to claim 32 wherein the diverter plate includes stiffening ribs.
41. A diverter plate for a vehicle cooling fan according to claim 32 wherein the diverter plate is mounted to the vehicle structure by way of a first mounting boss located directly above the central aperture and one or more additional mounting bosses providing additional attachment points for affixing the diverter plate to a front support of the vehicle.
42. A diverter plate for a vehicle cooling fan according to claim 41 wherein the first mounting boss is adapted to matingly fasten to a thermostat housing bolted to an engine block of the vehicle.
43. A diverter plate for a vehicle cooling fan according to claim 32 wherein a port is provided in the diverter plate for communicating fan discharge air directly to one or more pre-selected component(s).

44. A vehicle hood assembly for enclosing the engine compartment and cooling package of a vehicle comprising:

at least one surface having one or more air discharge apertures;
wherein the air discharge apertures are located so as to correspond in location with a fan and one or more air diverting structures which extend to the hood surface(s) when the hood assembly is closed.

45. A vehicle hood assembly according to claim 44 wherein the air discharge apertures of the hood assembly are fitted with screens or grids.

46. A vehicle cooling package comprising:

a heat exchanger assembly in fluid communication with an engine of a vehicle;

a fan;

a fan shroud mounted to the heat exchanger assembly, the fan shroud having a main body portion with a fan aperture therein, the fan aperture being defined by a circumferential wall extending outwardly from the main body portion of the fan shroud, a diverting surface extending from the circumferential wall opposite the main body portion at an angle to the axis of the fan when the fan is disposed in the fan aperture;

a diverter plate mounted adjacent to the fan shroud and spaced from the fan shroud such that the fan can be interposed generally between the fan shroud and the diverter plate, the diverter plate further having a main body angled from the axis of the fan when the cooling package is assembled to the vehicle, diffuser screens interposed between the main body of the diverter plate and the diverting surface of the fan shroud when the fan shroud and diverter plate are assembled to the vehicle; and,

a vehicle hood assembly having at least one surface having one or more air discharge apertures, the air discharge apertures being located so as to correspond in location with the space between the diverting surface of the fan shroud and the diverter plate when the hood assembly is mounted to the vehicle and closed;

wherein the diverting surface of the fan shroud and the diverter plate both extend toward the hood assembly when the hood assembly is mounted to the vehicle and the hood is closed, and the angles of the diverting surface of the fan shroud and the diverter plate closely match a natural discharge angle of the fan so that air being discharged from the fan is discharged at a high velocity from under the hood through the air discharge apertures and discharge openings of the hood assembly.

47. A vehicle cooling package according to claim 46 wherein the heat exchanger assembly comprises one or more heat exchangers mounted to a frame.

48. A vehicle cooling package according to claim 46 wherein the fan shroud is mounted to the frame and provides a generally enclosed air passage between the heat exchanger(s) and the fan, which is partially disposed within the fan shroud.

49. A vehicle cooling package according to claim 46 wherein the fan shroud is a unitary member molded from a thermoset or thermoplastic material.

50. A vehicle cooling package according to claim 46 wherein the fan shroud includes one or more mounting flanges adapted to mateably engage the heat exchanger frame.

51. A vehicle cooling package according to claim 46 wherein the diverting surface and main body portion include stiffening ribs.

52. A vehicle cooling package according to claim 46 wherein the fan shroud has plumbing recesses or apertures.

53. A vehicle cooling package according to claim 46 wherein the diverter plate has a main section and a removable section.

54. A vehicle cooling package according to claim 53 wherein the main section and removable section are each provided with mating flanges to facilitate attachment of the sections to one another by way of appropriate fasteners.

55. A vehicle cooling package according to claim 46 wherein the diverter plate includes a pair of side flanges extending perpendicularly outward from the main body.

56. A vehicle cooling package according to claim 46 wherein the diverter plate includes a central aperture in the main body portion.

57. A vehicle cooling package according to claim 46 wherein the side flanges serve as a mounting surface for screens adapted to fit over the gap between the fan shroud and the diverter plate to prevent foreign objects from being introduced into the fan area even when the hood is opened.

58. A vehicle cooling package according to claim 46 wherein the diverter plate includes plumbing recesses or apertures.

59. A vehicle cooling package according to claim 46 wherein the diverter plate includes stiffening ribs.

60. A vehicle cooling package according to claim 46 wherein the diverter plate is mounted to the vehicle structure by way of a first mounting boss located directly above the central aperture and one or more additional mounting bosses providing additional attachment points for affixing the diverter plate to a front support of the vehicle.

61. A vehicle cooling package according to claim 60 wherein the first mounting boss is adapted to matingly fasten to a thermostat housing bolted to an engine block of the vehicle.

62. A vehicle cooling package according to claim 46 wherein the air discharge apertures of the hood assembly are fitted with screens or grids.

63. A vehicle cooling package according to claim 46 wherein a vehicle front support has one or more air discharge vents that are generally aligned with the space between the diverting surface of the fan shroud and the diverter plate.

64. A vehicle cooling package according to claim 46 wherein a wheel well louver has one or more air discharge vents that are generally aligned with the space between the diverting surface of the fan shroud and the diverter plate.

65. A vehicle cooling package according to claim 46 wherein the fan has a naturally radial discharge component of 60 to 80 degrees.